



Impacts of Variational Bias Correction on GEOS-5 Temperature Analyses & Assimilation of 15 μm CO_2 Channels from AIRS

Motivation & Objectives

The current scheme for radiance bias correction in GEOS-5 is variational bias correction (VarBC). The advantage of VarBC is that the bias estimate is adaptive and consistent with all components in the analysis. However, it does not work well in regions where observations are sparse. It is prone to include systematic errors from forecast model. One example of such regions is the upper stratosphere and mesosphere. The goal of this study is to assess the impact of VarBC on GEOS-5 temperature analyses for two types of observations peaking in the upper stratosphere: (1) AMSU-A channel 14 and (2) 15 μm CO_2 channels from AIRS.

GEOS-5 Experiments

VBC ON (Operational)
VBC OFF (Experiments)

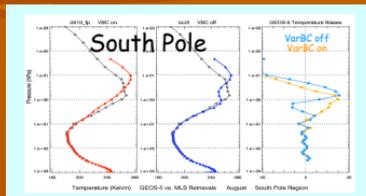
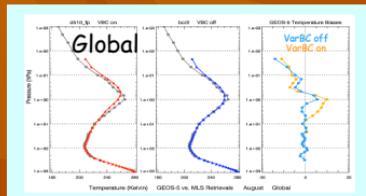
Year	Configuration	Channels
2006-2007	spin-up	February
2008	spin-up	August
2006-2007	2008	GEOS-5.1.0 Operational Run d510_fp
	bcr1	No AIRS 15 μm CO_2 channels
	bcr2	AIRS 15 μm CO_2 channels 78-86
	bcr3a	AIRS 15 μm CO_2 channels 73, 78-86
	bcr3b	AIRS 15 μm CO_2 channels 73, 78-86
	bcr3c	AIRS 15 μm CO_2 channels 73, 78-86, 74-77

- Resolutions: 0.5° (Lat) x 0.66° (Lon) x 72° (Lev)
- VarBC ON/OFF for AMSU-A channel 14
- Add 15 μm CO_2 channels from AIRS

Impact of Variational Bias Correction



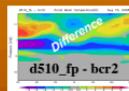
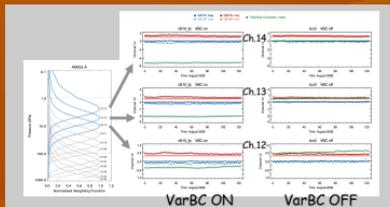
Validate the impact with retrieved temperatures from the Microwave Limb Sounding (MLS) instrument - 95,000 collocations for monthly statistics



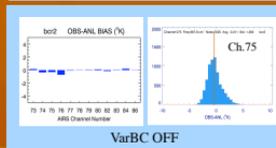
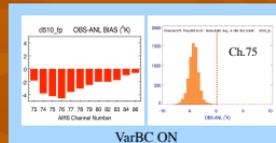
Bias is reduced significantly when VarBC is off for AMSU-A Ch.14

Problem with gravity wave drag modeling in South Pole region

The fit of the GEOS-5 temperatures to AMSU-A channels 12 and 13 peaking in the upper stratosphere improves when VarBC is off for AMSU-A channel 14



15 μm CO_2 Channels from AIRS



GEOS-5 temperature analyses show significant better fit to AIRS passive channels 73-86 in the 15 μm CO_2 absorption band

- Good agreement with MLS up to 2 hPa
- Negative impact from AIRS channels in the mesosphere due to spurious temperature Jacobians from CRTM near the model top

